

Ten Ways to Mitigate Summer Stress on Putting Greens

Techniques to help putting greens survive summer heat and thrive throughout the year

BY ELLIOTT DOWLING AND BLAKE MEENTEMEYER



Excessive stress causes turf decline that can affect playing conditions. Prevention and proactive management help minimize stress and maximize playing quality.

The playing condition of putting greens has a tremendous impact on the golf experience. Consequently, superintendents spend a great deal of time and resources trying to ensure that putting greens are healthy and playing their best. If putting greens are consistently smooth and true, golfers tend to overlook blemishes on other areas of a golf course. On the other hand, when putting greens are

in poor condition, golfers often form a negative impression of the entire golf experience, regardless of overall course conditions.

Putting green turf is subjected to many forms of stress. To achieve smooth and firm conditions, putting greens may be mowed daily at ultra-low mowing heights, rolled multiple times per week, groomed, brushed, verticut, and supplied with judicious

amounts of water and nutrients. These practices help produce high-quality playing conditions, but they can also leave turf in a weakened state.

During periods of mild weather, superintendents can subject putting greens to high levels of stress while still maintaining adequate turfgrass health. However, the environmental stresses of summer can quickly change the equation, especially for

cool-season putting greens. A combination of mechanical stress, heat stress, and heavy rain can push turf over the edge, possibly culminating in damage ranging from thin turf to rapid decline. Even a modest increase in temperature or a small amount of rainfall at the wrong time can spell disaster if superintendents do not accordingly adjust putting green management.

In the event of turf damage, superintendents must quickly assess the situation, determine the causes of the decline, adjust maintenance practices, and develop a recovery plan. Turf decline is often caused by a combination of stresses, but understanding what triggered the decline will help guide recovery efforts and prevent similar issues in the future. The following programs are suggested to help reduce summer stress and mitigate turf damage on putting greens.

PREVENTION

The importance of providing favorable growing environments for putting greens cannot be overstated. Without a good growing environment, even well-constructed putting greens with

the best management will struggle during stressful weather. Providing a good growing environment is the best way to ensure healthy turf, especially during summer. Key practices that optimize turf health focus on providing ample sunlight and air movement, aerating and topdressing at appropriate intervals to maintain a healthy rootzone, providing adequate drainage to flush excess water and salts, and the timely use of plant protectants to reduce pests.

1. HAND WATERING AND SYRINGING

Superintendents and their staffs hand water and syringe to supplement irrigation systems. No irrigation system is perfect, so hand watering — especially when paired with portable moisture meters to identify areas that need water — provides supplemental soil moisture to dry areas. On the other hand, syringing applies only small amounts of water that settles on the leaf blades, cooling the turf canopy as the water evaporates.

During hot weather, superintendents and their staffs often implement hand watering and syringing as part of a “wilt

patrol,” whereby experienced staff members monitor every putting green for signs of heat and drought stress. Turf areas exhibiting symptoms of wilt are either hand watered or syringed as needed to mitigate stress throughout the day. However, care must be taken because applying too much water can actually increase the surface temperature of putting greens, preventing the soil and roots from adequately cooling down. The overall irrigation plan should focus on applying just enough water to support healthy turf growth and ensure sufficient transpiration occurs to cool the plants throughout the day.

2. REMOVE TREES THAT BLOCK AIR MOVEMENT AND SUNLIGHT

Trees and underbrush that block prevailing winds put putting greens in jeopardy by creating a hotter, more humid microclimate. Air movement across a turf canopy is necessary to maintain the transpirational cooling that influences plant metabolism. Without transpiration, overheating could lead to the denaturation of proteins and cause plant death.



Hand watering and syringing help prevent turf stress. These techniques are most effective when paired with a portable moisture meter.



Fans generate air movement that aids transpiration and evaporative cooling. They can be especially effective in humid areas where trees block prevailing winds.

4. USE FANS TO REDUCE THE BOUNDARY LAYER

A boundary layer — i.e., a layer of humid, stagnant air — is created near the surface of putting greens when water vapor exits turfgrass leaves and surrounds the turf. The factors that determine boundary layer thickness are transpiration rate, relative humidity, temperature, and wind speed. A thick boundary layer, common in humid environments, can significantly limit transpirational cooling.

Turf fans, which generate turbulent air movement, help disrupt boundary layers and improve transpiration and evaporative cooling. Fans mix often drier surrounding air with stagnant, humid boundary layer air, thereby

reducing the humidity near turfgrass canopies. Research has also demonstrated that rootzone temperature, canopy temperature, and rooting depth are strongly correlated to wind speed, which can be increased by using oscillating fans (McCall et al., 2014). Further data indicate that running fans for 24 hours can increase root length and weight while providing significantly cooler soil temperatures (Guertal and Han, 2009).

The thickness of a boundary layer will determine how effectively a fan can help cool turf. Fans have less of an impact in low-humidity environments because boundary layers are thin and have a minimal effect on transpirational cooling. It is important to note that

when fans and syringing are used in combination, they are more effective at reducing heat stress on cool-season putting greens than either practice is on its own.

3. SPOON FEED NUTRIENTS

Applying light amounts of fertilizer — i.e., spoon feeding — is an effective way to manage plant growth, limit turf stress, and stimulate the recovery of injured turf. Using products that have a high potential to burn turf should be avoided during periods of summer stress.

The salt indices of common fertilizers are readily available and should be referenced when considering which products to use during periods of heat stress (Beard, 2002). A low salt index means a product has low burn potential. When making soluble fertilizer applications, a good rule of thumb is to keep per-application nitrogen rates below 0.15 pound per 1,000 square feet. Nitrate fertilizers should be avoided unless extremely low rates are used and water is immediately applied to minimize burn potential. Also, nitrogen from reclaimed water should be monitored to avoid excess growth and puffy turf conditions during summer.

In conjunction with low rates of nitrogen, several specialty products containing biostimulants and cytokinins have been used to improve the visual quality of creeping bentgrass during heat stress (Xu and Huang, 2010). When used throughout the growing season, the growth regulator trinexapac-ethyl also can improve surface quality by enhancing turf color and density. Achieve optimal control of turfgrass growth by using light rates of growth regulators and consulting growing degree-day models to determine the best frequency of application.

5. OPTIMIZE DRAINAGE AND OXYGEN EXCHANGE

Heat stress can cause serious turf problems when coupled with heavy rainfall and poor drainage. Water in saturated soils absorbs heat from the sun and triggers root dieback. The low oxygen levels in saturated soils also limit the ability of any remaining roots to absorb water, leading to wet wilt.

Without sufficient water uptake and transpirational cooling, direct high temperature kill is possible.

Venting with 0.25-inch diameter solid tines improves gas exchange, helps increase oxygen in the rootzone, accelerates surface drying, and returns normal functionality to the root system. It is important to note that venting can cause additional stress and turf injury if it is performed during periods of high temperatures or severe drought stress. Defer venting treatments until temperatures moderate in the evening or early morning to reduce the risk of turf injury.

MINIMIZE MECHANICAL STRESS

Even with an optimum growing environment and sound agronomic programs in place, turf decline can be unavoidable during hot weather. Once decline starts, it is imperative to [prevent further damage](#) by focusing on

plant health and survival rather than playability.

6. RAISE HEIGHT OF CUT

One of the most effective ways to reduce stress on turf is to raise the height of cut (HOC). However, with the demand for fast green speeds, superintendents mow putting greens at extremely low heights that can lead to turf decline during stressful weather. Regardless of the [mowing height](#), cool-season turf quality and photosynthesis often significantly decline during July and August. If weather forecasts predict a stretch of hot weather, or if putting greens become stressed during summer months, immediately raise the HOC. During summer a slightly higher HOC can significantly improve creeping bentgrass physiology and playing quality; even 1/32 of an inch can make a difference (Huang et al., 2000).

7. ALTERNATE BETWEEN MOWING AND ROLLING

Mowing is one of the most stressful practices performed on putting greens. Alternating between mowing and rolling reduces turf stress and can help maintain quality playing conditions during stressful weather. In an interview, Dr. John Sorochan of the University of Tennessee indicated that two to three days per week without mowing reduces turf stress and hastens recovery by increasing the amount of photosynthetic surface area of turf-grass leaves. Monitoring clipping yields and overall turf health helps determine when to skip a mowing day. If clipping yields decrease, superintendents should consider skipping mowing because turf growth is slow.

When golfers hear that putting greens will not be mowed daily, their immediate reaction is to assume that they will be slower and bumpier than normal. However, research indicates that alternating between mowing and rolling can produce ball roll distances equivalent to daily mowing (Nikolai, 2014). Ultimately, if the alternative is dead putting greens, choosing to alternate between mowing and rolling is the better option.

8. SKIP CLEANUP PASSES

Arguably, the interface between a putting green and green surround receives the greatest concentration of mechanical and foot traffic on a golf course. The turning of mowers, rollers, and other equipment in the collar and approach causes abrasion and compaction that weakens turf health. Superintendents can reduce mechanical stress around the margins of putting greens by occasionally skipping cleanup passes, using a cleanup mower set at a higher HOC, or doing both. Increasing the amount of leaf area that can photosynthesize will help keep plants healthy and tolerant of environmental stresses. Other options for protecting turf around the edges of putting greens include turning mowers on boards or mats and frequently emptying clipping baskets to reduce overall mower weight and the potential for scalping.



This checklist can be used as a reference to help prevent summer stress or to implement strategies that will help limit damage that has already occurred.

9. PROPER MOWER SETUP

The importance of proper mower setup is often underestimated, but it can be the difference between living or dead turf. Using solid front rollers instead of grooved rollers is a long-standing method to reduce putting green stress. Grooved rollers are often used because they can improve the quality of cut of putting greens. Unfortunately, grooved rollers sink deeper into the turf canopy, effectively lowering HOC and adding stress to the turf.

A sharp reel with light reel-to-bedknife contact also is important for maintaining turf health and preventing further decline. Mowing with dull bedknives and reel blades makes turf more vulnerable to diseases and insects (Whitlark and Daniels, 2016).

10. DEFER AGGRESSIVE MANAGEMENT PRACTICES

One of the most difficult decisions a superintendent has to make is when to defer management practices such as brushing, grooming, verticutting, aerating, and topdressing. Core aeration is one of the most effective cultural practices for reducing thatch and alleviating soil compaction, but the process can be highly stressful to turf (Christians et al., 2016). Delaying an aeration event is a difficult decision, but it can be necessary when putting greens are stressed. If aeration is performed when temperatures are high and humidity is low it can — and likely will — increase turf stress. The same can be true of topdressing. Applying sand and incorporating it into aeration holes is stressful and

can lead to turf decline if poorly timed.

Appropriately timed management practices can improve playability and turf health; poor timing can lead to rapid turf decline. When turf is under stress, there is no question that less is more when it comes to surface management. Aggressive management practices should be accomplished proactively rather than reactively.

CONCLUSION

Putting greens are the most important playing surfaces on a golf course and keeping them in good condition during stressful summer months can be a significant challenge. Superintendents use many tools and techniques to help protect putting greens from mechanical and environmental stress. The first key



Solid front rollers help reduce turf stress by evenly spreading the weight of mowing equipment across a large surface.



Surface management practices are beneficial when performed at the right time, but they can be harmful if performed during stretches of stressful summer weather.

to success is creating the best possible growing environment. This is accomplished through proactive management strategies designed to maximize turf health. When turf does become stressed, managing mechanical damage will help reduce the risk of injury and limit the extent of any resulting damage. However, Mother Nature has the upper hand and there will always be a risk of turf damage during extreme environmental conditions. Hopefully, the techniques highlighted in this article will help the putting greens at your facility survive summer heat and thrive throughout the year.

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ELLIOTT DOWLING *is an agronomist in the USGA Green Section Northeast Region.* BLAKE MEENTEMEYER *is an agronomist in the USGA Green Section West Region.*

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